CLAIMS

What is claimed is:

1. A soybean seed exhibiting an oil composition comprising 55 to 80% by weight oleic acid, 10 to 40% by weight linoleic acid, 6% or less by weight linolenic acid, and 2 to 8% by weight saturated fatty acids.

2. The soybean seed of claim 1, wherein said seed comprises a recombinant nucleic acid molecule, said molecule comprising

a first set of DNA sequences that is capable, when expressed in a host cell, of suppressing the endogenous expression of at least two genes selected from the group consisting of *FAD2*, *FAD3*, and *FATB* genes, and

a second set of DNA sequences that is capable, when expressed in a host cell, of increasing the endogenous expression of at least one gene selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene.

3. The soybean seed of claim 2, wherein said seed exhibits an increased oleic acid content, a reduced saturated fatty acid content, and a reduced polyunsaturated fatty acid content relative to seed from a plant with a similar genetic background but lacking the recombinant nucleic acid molecule.

4. The soybean seed of claim 2, wherein the oil composition further comprises 10 to 39% by weight linoleic acid, 4.5% or less by weight linolenic acid, and 3 to 6% by weight saturated fatty acids.

5. The soybean seed of claim 2, wherein the oil composition further comprises 10 to 39% by weight linoleic acid, 3.0% or less by weight linolenic acid, and 2 to 3.6% by weight saturated fatty acids.

6. The soybean seed of claim 2, wherein the oil composition further comprises 11 to 30% by weight linoleic acid, 4.5% or less by weight linolenic acid, and less than 6% by weight saturated fatty acids.

7. Oil derived from the soybean seed of claim 2, wherein said oil exhibits an increased oleic acid content, a reduced saturated fatty acid content, and a reduced polyunsaturated fatty acid content relative to oil derived from seed of a plant with a similar genetic background but lacking the recombinant nucleic acid molecule.

8. Meal derived from the soybean seed of claim 2.

9. A container of soybean seeds, wherein at least 25% of the seeds exhibit an oil composition comprising 55 to 80% by weight oleic acid, 10 to 40% by weight linoleic acid, 6% or less by weight linolenic acid, and 2 to 8% by weight saturated fatty acids.

10. A soybean seed exhibiting an oil composition comprising 65 to 80% by weight oleic acid, 10 to 30% by weight linoleic acid, 6% or less by weight linolenic acid, and 2 to 8% by weight saturated fatty acids.

11. The soybean seed of claim 10, wherein the oil composition further comprises 10 to 29% by weight linoleic acid, 4.5% or less by weight linolenic acid, and 3 to 6% by weight saturated fatty acids.

12. The soybean seed of claim 10, wherein the oil composition further comprises 10 to 29% by weight linoleic acid, 3.0% or less by weight linolenic acid, and 2 to 3.6% by weight saturated fatty acids.

13. A crude soybean oil exhibiting an oil composition comprising 55 to 80% by weight oleic acid, 10 to 40% by weight linoleic acid, 6% or less by weight linolenic acid, and 2 to 8% by weight saturated fatty acids.

14. The crude soybean oil of claim 13, wherein said oil is selected from the group consisting of a cooking oil, a salad oil, and a frying oil.

15. The crude soybean oil of claim 13, wherein said oil is a raw material for making a substance selected from the group consisting of shortening, margarine, lubricant, biodiesel, heating oil, and diesel additive.

16. The crude soybean oil of claim 13, wherein said oil is produced in a volume greater than one liter.

17. The crude soybean oil of claim 16, wherein said oil is produced in a volume greater than ten liters.

18. A crude soybean oil exhibiting an oil composition comprising 65 to 80% by weight oleic acid, 10 to 40% by weight linoleic acid, 6% or less by weight linolenic acid, and 2 to 8% by weight saturated fatty acids.

19. A crude soybean oil exhibiting an oil composition which comprises 69 to 73% by weight oleic acid, 21 to 24% by weight linoleic acid, 0.5 to 3% by weight linolenic acid, and 2-3% by weight of saturated fatty acids.

20. The crude soybean oil of claim 19, wherein said oil is selected from the group consisting of a cooking oil, a salad oil, and a frying oil.

21. The crude soybean oil of claim 19, wherein said oil is a raw material for making a soyfood.

22. A transformed soybean plant bearing seed, wherein said seed exhibits an oil composition which comprises 55 to 80% by weight oleic acid, 10 to 40% by weight linoleic acid, 6% or less by weight linolenic acid, and 2 to 8% by weight saturated fatty acids.

23. The transformed soybean plant of claim 22, wherein said transformed soybean plant comprises a recombinant nucleic acid molecule which comprises

a first set of DNA sequences that is capable, when expressed in a host cell, of suppressing the endogenous expression of a *FAD2* gene and a *FAD3* gene, and

a second set of DNA sequences that is capable, when expressed in a host cell, of increasing the endogenous expression of at least one gene selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene.

24. Feedstock derived from the transformed plant of claim 23.

25. A plant part derived from the transformed plant of claim 23.

26. Seed derived from the transformed plant of claim 23.

27. A transformed plant comprising a recombinant nucleic acid molecule which comprises

a first set of DNA sequences that is capable, when expressed in a host cell, of suppressing the endogenous expression of at least two genes selected from the group consisting of *FAD2*, *FAD3*, and *FATB* genes, and

a second set of DNA sequences that is capable, when expressed in a host cell, of increasing the endogenous expression of at least one gene selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene.

28. The transformed plant of claim 27, wherein said transformed plant is a temperate oilseed plant.

29. The transformed plant of claim 27, wherein said transformed plant is a soybean plant.

30. The transformed plant of claim 27, wherein said transformed plant produces a seed with an increased oleic acid content, a reduced saturated fatty acid content, and a reduced polyunsaturated fatty acid content, relative to a plant with a similar genetic background but lacking the recombinant nucleic acid molecule.

31. A method of altering the oil composition of a plant cell comprising:

(A) transforming a plant cell with a recombinant nucleic acid molecule which comprises a first set of DNA sequences that is capable, when expressed in a host cell, of suppressing the endogenous expression of at least two genes selected from the group consisting of *FAD2*, *FAD3*, and *FATB* genes, and a second set of DNA sequences that is capable, when expressed in a host cell, of increasing the endogenous expression of at least one gene selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene; and

(B) growing said plant cell under conditions wherein transcription of said first set of DNA sequences and said second set of DNA sequences is initiated, whereby said oil composition is altered relative to a plant cell with a similar genetic background but lacking the recombinant nucleic acid molecule.

32. The method of claim 31, wherein said growing step produces a plant cell with at least partially reduced levels of a *FAD2* enzyme and a *FAD3* enzyme, and at least partially enhanced levels of said at least one gene selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene.

33. The method of claim 31, wherein said cell is present in a multicellular environment.

34. The method of claim 33, wherein said cell is present in a transformed plant.

35. The method of claim 31, wherein said alteration comprises an increased oleic acid content, a reduced saturated fatty acid content, and a reduced polyunsaturated fatty acid content, relative to a plant cell with a similar genetic background but lacking the recombinant nucleic acid molecule.

36. A method of producing a transformed plant having seed with a reduced saturated fatty acid content comprising:

(A) transforming a plant cell with a recombinant nucleic acid molecule which comprises a first set of DNA sequences that is capable, when expressed in a host cell, of suppressing the endogenous expression of at least two genes selected from the group consisting of *FAD2*, *FAD3*, and *FATB* genes, and

a second set of DNA sequences that is capable, when expressed in a host cell, of increasing the endogenous expression of at least one gene selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene; and

(B) growing the transformed plant, wherein the transformed plant produces seed with a reduced saturated fatty acid content relative to seed from a plant having a similar genetic background but lacking the recombinant nucleic acid molecule.

37. The method of claim 36, wherein said growing step further comprises expressing the first set of DNA sequences and said second set of DNA sequences in a tissue or organ of a plant, wherein said tissue or organ is selected from the group consisting of roots, tubers, stems, leaves, stalks, fruit, berries, nuts, bark, pods, seeds and flowers.

38. The method of claim 36, wherein said growing step further comprises expressing the first set of DNA sequences and said second set of DNA sequences in a seed.

39. A recombinant nucleic acid molecule comprising:

a first set of DNA sequences that is capable, when expressed in a host cell, of suppressing the endogenous expression of at least two genes selected from the group consisting of *FAD2*, *FAD3*, and *FATB* genes; and

a second set of DNA sequences that is capable, when expressed in a host cell, of increasing the endogenous expression of at least one gene selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene.

40. The recombinant nucleic acid molecule of claim 39, wherein said first set of DNA sequences comprises a first non-coding sequence that is capable, when expressed in a host cell, of suppressing the endogenous expression of a *FAD2* gene; and a second non-coding sequence that is capable, when expressed in a host cell, of suppressing the endogenous expression of a *FAD3-1A* gene.

41. The recombinant nucleic acid molecule of claim 40, wherein the first set of DNA sequences is expressed as a sense cosuppression RNA transcript.

42. The recombinant nucleic acid molecule of claim 40, wherein the first non-coding sequence is expressed as a first sense cosuppression RNA transcript, and the second non-coding sequence is expressed as a second sense cosuppression RNA transcript, and the first and second sense cosuppression transcripts are not linked to each other.

43. The recombinant nucleic acid molecule of claim 40, wherein the first set of DNA sequences is expressed as an antisense RNA transcript.

44. The recombinant nucleic acid molecule of claim 40, wherein the first non-coding sequence is expressed as a first antisense RNA transcript, and the second non-coding sequence is expressed as a second antisense RNA transcript, and the first and second antisense transcripts are not linked to each other.

45. The recombinant nucleic acid molecule of claim 40, wherein the first set of DNA sequences is expressed as an RNA transcript capable of forming a single double-stranded RNA molecule.

46. The recombinant nucleic acid molecule of claim 40, wherein said first set of DNA sequences further comprises a third non-coding sequence that is capable, when expressed in a host cell, of suppressing the endogenous expression of a *FAD3-1B* gene.

47. The recombinant nucleic acid molecule of claim 46, wherein said first non-coding sequence is a *FAD2-1A* sequence, said second non-coding sequence is a *FAD3-1A* sequence, and said third non-coding sequence is a *FAD3-1B* sequence.

48. The recombinant nucleic acid molecule of claim 47, wherein said *FAD2-1A* sequence is selected from the group consisting of a *FAD2-1A* intron sequence, a *FAD2-1A* 3'UTR sequence, and a *FAD2-1A* 5'UTR sequence.

49. The recombinant nucleic acid molecule of claim 47, wherein said *FAD3-1A* sequence is selected from the group consisting of a *FAD3-1A* intron sequence, a *FAD3-1A* 3' UTR sequence, and a *FAD3-1A* 5' UTR sequence.

50. The recombinant nucleic acid molecule of claim 47, wherein said *FAD3-1B* sequence is selected from the group consisting of a *FAD3-1B* intron sequence, a *FAD3-1B* 3'UTR sequence, and a *FAD3-1B* 5'UTR sequence.

51. The recombinant nucleic acid molecule of claim 40, wherein said first set of DNA sequences further comprises a third non-coding sequence that is capable, when expressed in a host cell, of suppressing the endogenous expression of a *FATB* gene.

52. The recombinant nucleic acid molecule of claim 51, wherein said *FATB* sequence is selected from the group consisting of a *FATB-1* intron sequence, a *FATB-1* 3' UTR sequence, a *FATB-1* 5' UTR sequence, a *FATB-2* intron sequence, a *FATB-2* 3'UTR sequence, and a *FATB-2* 5' UTR sequence.

53. The recombinant nucleic acid molecule of claim 39, further comprising a plant promoter operably linked to said first set of DNA sequences.

54. The recombinant nucleic acid molecule of claim 53, wherein said plant promoter is a *FAD2-1A* promoter, a 7Sα promoter, or a 7Sα' promoter.

55. The recombinant nucleic acid molecule of claim 39, wherein said second set of DNA sequences is capable, when expressed, of increasing the endogenous expression of at least two genes selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene.

56. The recombinant nucleic acid molecule of claim 39, wherein said second set of DNA sequences is capable, when expressed, of increasing the endogenous expression of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene.

57. The recombinant nucleic acid molecule of claim 39, wherein said first set of DNA sequences and said second set of DNA sequences are arranged in a monocistronic configuration.

58. The recombinant nucleic acid molecule of claim 39, wherein said second set of DNA sequences and said second set of DNA sequences are arranged in a polycistronic configuration.

59. A recombinant nucleic acid molecule comprising:

a first set of DNA sequences that is capable, when expressed in a host cell, of suppressing the endogenous expression of a *FAD2* gene and a *FAD3* gene, wherein said first set of DNA sequences comprises a first non-coding sequence that expresses a first RNA sequence that exhibits at least 90% identity to a non-coding region of a *FAD2* gene, a first antisense sequence that expresses a first antisense RNA sequence capable of forming a double-stranded RNA molecule with the first RNA sequence, a second non-coding sequence that expresses a second RNA sequence that exhibits at least 90% identity to a non-coding region of a *FAD3* gene, and a second antisense sequence that expresses a second antisense RNA sequence capable of forming a double-stranded RNA molecule with the second RNA sequence;

and a second set of DNA sequences that is capable, when expressed in a host cell, of increasing the endogenous expression of at least one gene selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene.

60. The recombinant nucleic acid molecule of claim 59, wherein said non-coding region of a *FAD2* gene is selected from the group consisting of a *FAD2-1A* intron sequence, a *FAD2-1A* 3'UTR sequence, and a *FAD2-1A* 5'UTR sequence.

61. The recombinant nucleic acid molecule of claim 59, wherein said non-coding region of a *FAD3* gene is selected from the group consisting of a *FAD3-1A* intron sequence, a *FAD3-1A* 3'UTR sequence, and a *FAD3-1A* 5'UTR sequence.

62. The recombinant nucleic acid molecule of claim 59, wherein said non-coding region of a *FAD3* gene is selected from the group consisting of a *FAD3-1B* intron sequence, a *FAD3-1B* 3'UTR sequence, and a *FAD3-1B* 5'UTR sequence.

63. The recombinant nucleic acid molecule of claim 59, wherein the first set of DNA sequences is expressed as an RNA transcript capable of forming a single double-stranded RNA molecule.

64. The recombinant nucleic acid molecule of claim 59, further comprising a spacer sequence that separates the first and second non-coding sequences from the first and second antisense sequences such that the first set of DNA sequences is capable, when expressed, of forming a single double-stranded RNA molecule.

65. The recombinant nucleic acid molecule of claim 64, wherein said spacer sequence is a spliceable intron sequence.

66. The recombinant nucleic acid molecule of claim 65, wherein said spliceable intron sequence is a spliceable *FAD3* intron #5 sequence or a spliceable PDK intron sequence.

67. The recombinant nucleic acid molecule of claim 59, wherein said non-coding region of a *FAD3* gene is a *FAD3-1A* sequence, and wherein said first set of DNA sequences further comprises a third non-coding sequence that expresses a third RNA sequence that exhibits at least 90% identity to a non-coding region of a *FAD3-1B* gene, and a third antisense sequence that expresses a third antisense RNA sequence capable of forming a double-stranded RNA molecule with the third RNA sequence.

68. The recombinant nucleic acid molecule of claim 59, further comprising a third non-coding sequence that is capable of expressing a third RNA sequence that exhibits at least 90% identity to a non-coding region of a *FATB* gene, and a third antisense sequence that is capable of expressing a third antisense RNA sequence capable of forming a double-stranded RNA molecule with the third RNA sequence.

69. The recombinant nucleic acid molecule of claim 68, wherein said *FATB* sequence is selected from the group consisting of a *FATB-1* intron sequence, a *FATB-1* 3' UTR sequence, a *FATB-1* 5' UTR sequence, a *FATB-2* intron sequence, a *FATB-2* 3'UTR sequence, and a *FATB-2* 5' UTR sequence.

70. A recombinant nucleic acid molecule comprising:

a first set of DNA sequences that is capable, when expressed in a host cell, of suppressing the endogenous expression of a *FAD2* gene and a *FAD3* gene; and

a second set of DNA sequences that comprises a first coding sequence that is capable of expressing a CP4 EPSPS gene, and a second coding sequence that is capable, when expressed, of increasing the endogenous expression of a gene selected from the group consisting of a beta-ketoacyl-ACP synthase I gene, a beta-ketoacyl-ACP synthase IV gene, and a delta-9 desaturase gene.

71. The recombinant nucleic acid molecule of claim 70, wherein said first set of DNA sequences and said second set of DNA sequences are located on a single T-DNA region.

72. The recombinant nucleic acid molecule of claim 70, wherein said first set of DNA sequences and said second coding sequence are located on a first T-DNA region, and said first coding sequence is located on a second T-DNA region.

73. A nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 29, 30, and 31.

74. A nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 44, 45, 46, and 47.